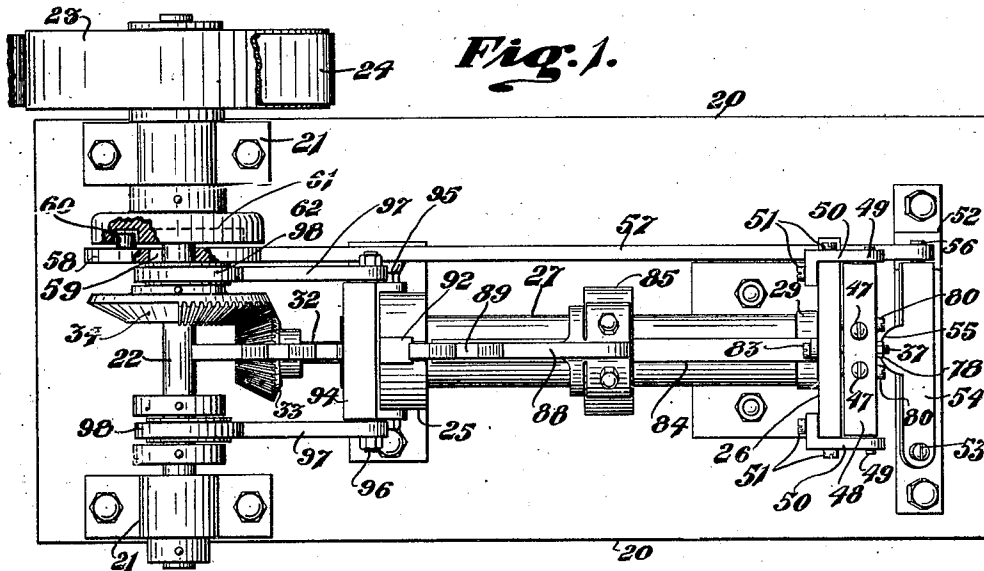
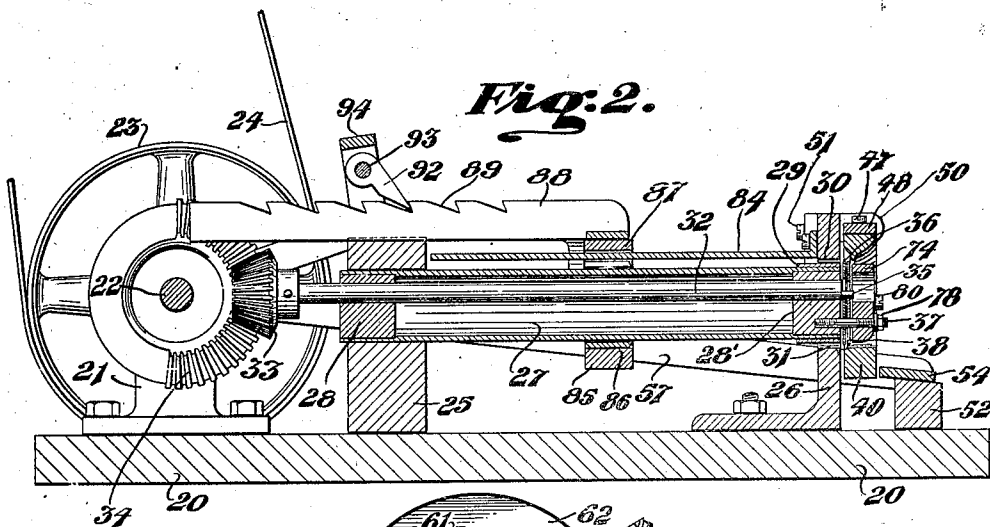
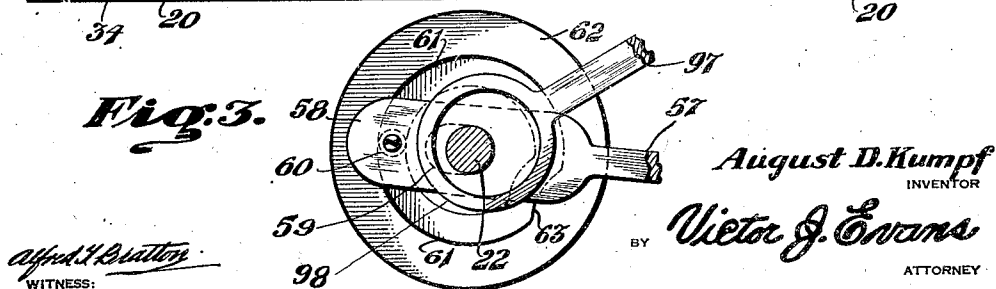


Dec. 19, 1922.

1,439,559.

A. D. KUMPF.
ELBOW MAKING MACHINE.
FILED SEPT. 24, 1921.

4 SHEETS—SHEET 1.

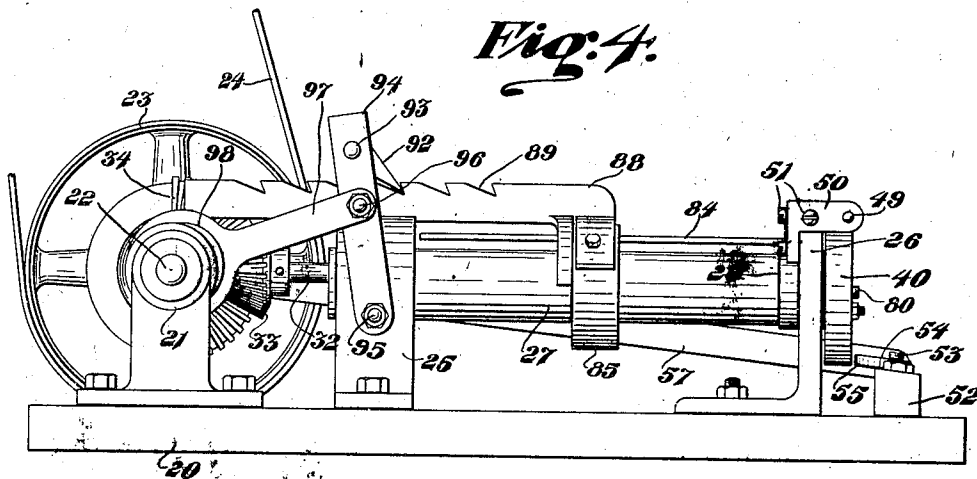
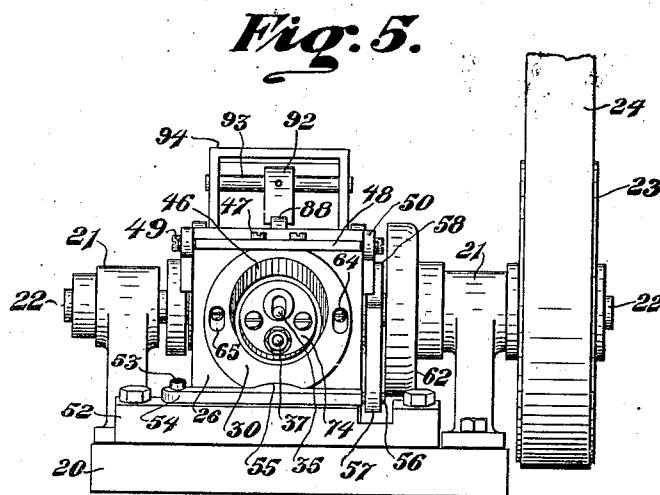


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4 SHEETS—SHEET 2.



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4 SHEETS—SHEET 3.

Fig. 6.

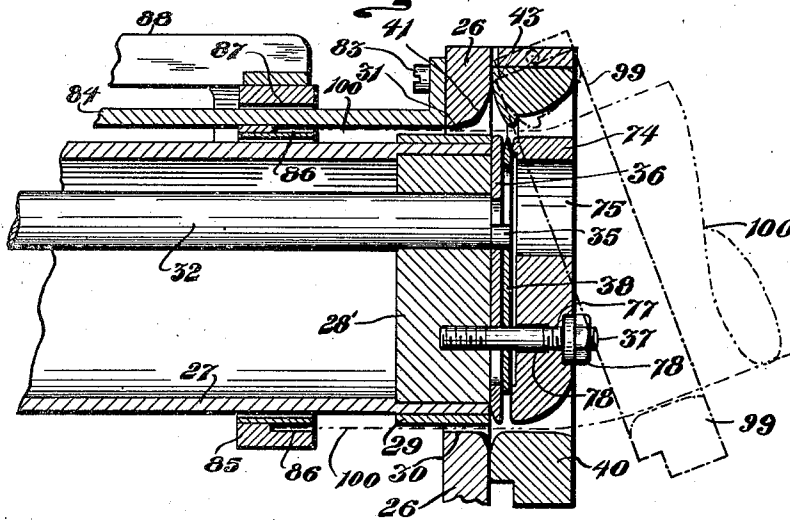


Fig. 7.

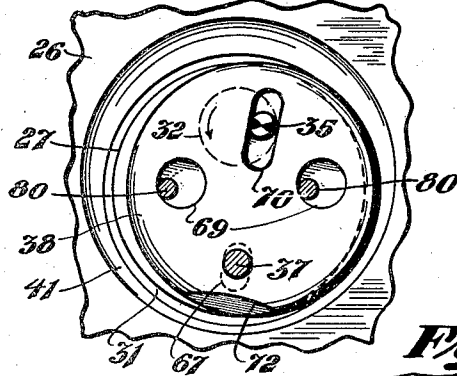


Fig. 8.

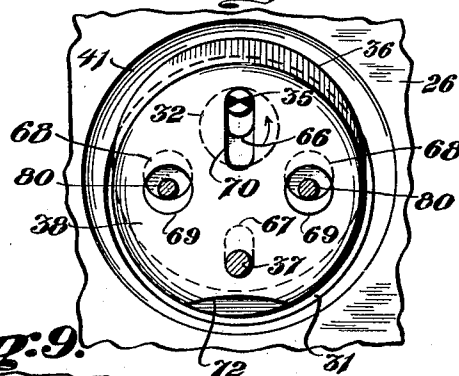
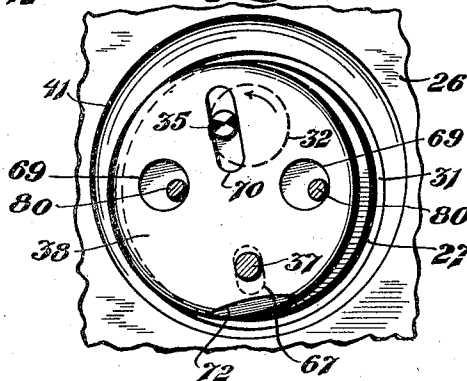


Fig. 9.



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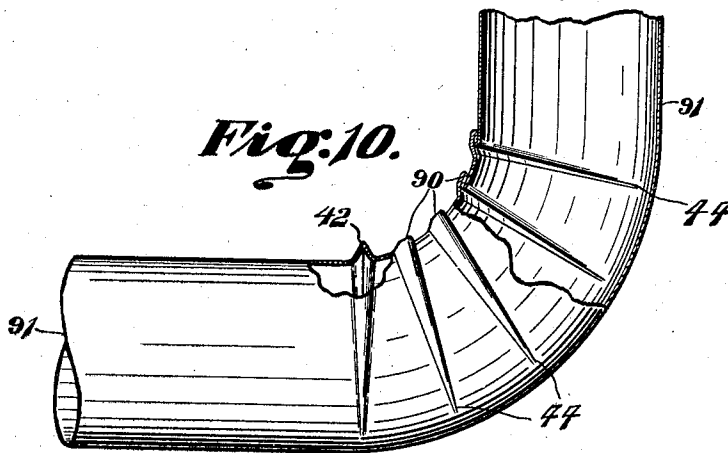
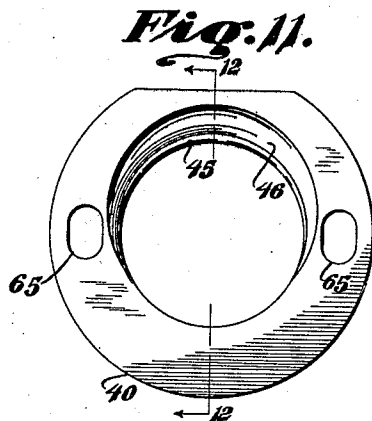
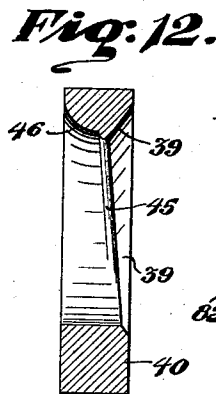
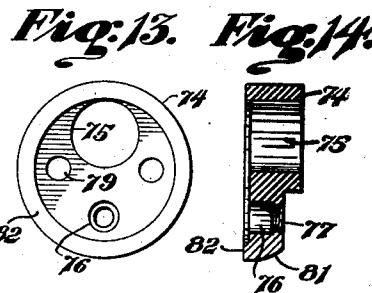
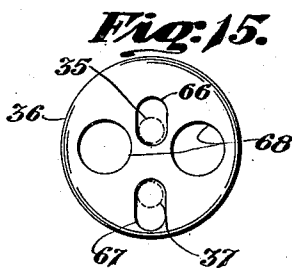
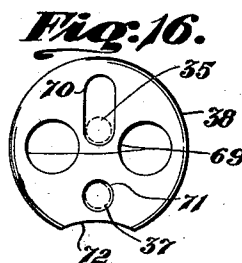
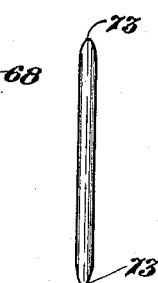
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ELBOW MAKING MACHINE.
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1,439,559.

4 SHEETS—SHEET 4.



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UNITED STATES PATENT OFFICE.

AUGUST D. KUMPE, OF PHILADELPHIA, PENNSYLVANIA.

ELBOW-MAKING MACHINE.

Application filed September 24, 1921. Serial No. 502,933.

To all whom it may concern:

Be it known that I, AUGUST D. KUMPE, a citizen of the United States, residing at Philadelphia, in the county of Philadelphia and State of Pennsylvania, have invented new and useful Improvements in Elbow-Making Machines, of which the following is a specification.

This invention relates to machines or devices for forming sheet metal elbows and it has for its primary object to provide a machine of the type referred to which is characterized by a novel means for primarily forming expanded arcuate grooves or ribs in straight tubular sections, each groove or rib being subsequently creased or folded by compression simultaneously with the feeding forward of the tube ready for the forming of the succeeding groove or rib and the production step by step of the desired elbow section.

Another object of this invention is the provision of a machine for forming metal elbows from seamed or seamless straight tubular sections characterized by the fact that the creasing or folding operation proper results in the step by step accurate production of the requisite curvature in the elbow.

A further object is to provide a novel structure of machine for making sheet metal elbows out of, or from, straight tubular sections which are not seamed until after the elbow forming operation is completed.

A still further object of this invention is to provide an elbow making or forming machine comprising but few operating parts which will fashion or shape an elbow and effect the creasing operation in a simple and extremely efficient manner and thereby produce a comparatively smooth and attractively finished article.

Further objects of this invention are to simplify, facilitate and cheapen the manufacture of sheet metal elbows from seamless or seamed straight tubular sections.

With the foregoing and other objects in view as will become more apparent from the following description, my invention primarily consists in the formation of the expanded grooves or ribs by means of overlying formers, one of which is adapted for accurately eccentric and diametric displacement relative to a fixed center whereas the other oscillates from the one hand to the other on said center. The invention further consists in the novel features of con-

struction, combinations and arrangements of parts hereinafter fully described and more specifically defined by the appended claims.

In the further disclosure of the invention reference is to be had to the accompanying sheets of drawings, constituting a part of this specification, and in which like characters of reference designate the same or corresponding parts in all the views.

Figure 1 is a top plan view of an elbow making machine embodying the essential features of this invention.

Fig. 2 is a central longitudinal and vertical section through the elbow making machine with parts in outside elevation for the sake of clearness.

Fig. 3 is an enlarged detail view of certain cam and eccentric movements hereinafter more fully described.

Fig. 4 is a longitudinal side elevation of the complete machine.

Fig. 5 is an end view looking towards the left-hand of the preceding figure.

Fig. 6 is an enlarged fragmentary sectional view of the crease-forming and finishing mechanism.

Fig. 7 is a face view of the forming disks in the position they occupy after an initial quarter turn from their neutral position.

Fig. 8 is a similar face view illustrating the position occupied by the forming disks after a half turn.

Fig. 9 is a corresponding face view at the three-quarter turn position.

Fig. 10 is a fragmentary side view of an elbow as produced by my machine, part being broken away or in section for the sake of clearness.

Fig. 11 is an enlarged face view of an annular die and creasing collar for forming the elbow as hereinafter more fully described.

Fig. 12 is a section on the line 12-12 in the preceding figure and looking to the left-hand thereof.

Fig. 13 is an enlarged rear face view of a clamping die.

Fig. 14 is an axial longitudinal section of the same.

Fig. 15 is an enlarged detail face view of the inner forming-disk hereafter more specifically explained.

Fig. 16 is a similar detail face view of the outer forming-disk and later on particularly described; and,

Fig. 17 is an edge view showing in ex-

aggerated thickness the peripheral edge formation of the forming-disks referred to by the two preceding figures.

According to the embodiment of the invention shown I provide a base 20 conveniently—though not essentially—of rectangular configuration and adapted for clamping fixture wherever desired, said base 20 having secured thereon a pair of parallel disposed standards 21 fashioned to constitute journals or bearings for the drive shaft 22. This drive shaft may be rotated manually or power driven—as shown—by means of a pulley 23 and belt 24 from any convenient and suitable source. Similarly mounted on, or formed integral with, the aforesaid base 20, are a pair of spaced bearings 25, 26, disposed at right angles to the axis of the before mentioned standards 21, said latter bearings 25, 26, housing a tubular mandrel 27 which is plugged at each end by blocks 28 and 28'. It is to be here noted that the tubular mandrel 27 is rigidly held within the bearing 25 whilst the opposed end thereof is shrouded with a thin annular sleeve 29—the purpose and function whereof will be later on explained—and axially supported in the bore 30 of the bearing 26 to provide an entry clearance 31 for the tubular section to be subsequently formed into an elbow.

Longitudinally of the aforesaid tubular mandrel 27 is a shaft 32 which is journaled in the blocks 28 eccentric to the longitudinal axis of said mandrel 27, and this shaft 32 is adapted for intermittent rotation by means of a bevel gear 33 on the outer end thereof meshing at intervals with the toothed portion of a mutilated or interrupted gear-wheel 34 securely keyed on the drive shaft 22. Formed integral with or rigidly secured in the forward end of the shaft 32 is a crank pin 35 that serves in use to actuate or move a forming-disk 36—Figures 6, 7, 8 and 9—arcuately eccentric relative to a fixed point or stud 37 conveniently threaded into the outer end of the plug block 28' in the mandrel 27, whilst at the same time allowing of its displacement diametrically in a plane taken centrally through the said crank pin 35 and centrally through said stud 37, but at right angles to their axes. At the same time this crank pin 35 serves also to oscillate a second forming-disk 38 pivoted on the stud 37 in superficial abutment with the forming-disk 36 from the right to the left hand, and vice versa, as hereafter fully explained. The movements of these forming-disks 36, 38, effect the primary expansion of the metal tubular section outwardly into and between the arcuate flared portion 39 of an annular die and creasing collar 40 and the opposed correspondingly flared outer part 41 of the aforesaid bore 30 in the bearing 26 to inverted V-shaped cross section as shown

at the broken fragmentary part 42 in Figure 10, said expanded part 42 extending substantially around three-quarters of the circumference of the tubular section. It is also to be particularly noted that this outwardly expanded V-shaped part or bead 42 is of a maximum depth at the high point 43—Figure 6—of the opposed flarings 36 and 41, gradually and uniformly diminishing away to the lowermost parts of said expansion; in other words, the lower part of the tubular section being elbowed remains undisturbed and of its natural shape as between the low points 44—Figure 10—of the V-shaped expansion or outwardly bulged bead 42, the same being readily understood by those acquainted with the art to which this invention appertains.

The annular die and creasing collar 40 as will be best seen from Figures 10, 11 and 12, in addition to having the arcuate flaring 39 is formed with an arcuate rib or internal bead 45 similarly extending around substantially three-quarters of its bore and intermediate the inner and outer faces of said die or collar, the frontal part 46 being fashioned to a concave or moulded cross-section. In order to permit of this die or collar 40 having an outward and upward—or slight swinging—movement imparted thereto to effect the creasing as well as the step-by-step elbow forming operations, it is formed integral with or rigidly attached by studs 47 to a transverse bar 48 provided with pintles 49 at its ends which are journaled in angle bearings 50 securely clamped by studs 51 to the upper part of the hereinbefore referred to bearing 26. To effect the aforesaid up and down or rocking of the annular die and creasing collar 40 I preferably secure a removable and adjustable bar 52 transversely on the base 20 in front of the bearing 26, and on this bar 52 is pivoted at 53 what may be termed a locking lever 54 fashioned with a nose portion 55 adapted to contact with or normally be in engagement against the lower frontal and outer portion of said die and collar 40 as will be clearly understood on an examination of Figures 1, 2, 4 and 5, of the drawings more particularly. Suitably pivoted by a shouldered pin 56 on the free end of the locking lever 54 is a rod or pitman 57 having an elongated and flattened end 58, slotted at 59—Figures 1 and 3—over the drive shaft 22 and carrying a laterally projecting antifricition roller 60 that traverses the groove 61 of an internal cam 62, keyed or otherwise fixed on the aforesaid drive shaft 22. It is also to be noted that the groove 61 of the internal cam 62 is indented at 63—Figure 3—for the purpose later on explained, and it will be readily understood that rotation of the internal cam 62 will effect the eccentric reciprocation of the rod or pitman 57 and thereby the lateral move-

ment of the locking lever 54. As an additional precaution against accidental displacement of the annular die and creasing collar 41 guide pins 64 may be secured in the front of the bearing 26 for co-operation in slots 65 in said die 40.

Referring again to the hereinbefore mentioned forming-disks 36, 38 and more particularly to Figures 15, 16 and 17, it is to be observed that the forming-disk 36 is of circular disk formation and provided with upper and lower diametrically aligning slots 66, 67, respectively, and apertures 68; whereas the forming-disk 38 is of like size and provided with apertures 69 of like size to those designated 68, an elongated upper slot 70, a pivot hole 71 and a segmental cut away lower part 72. It is also to be noted that the peripheral edge of both forming disks are hyperbolically rounded off as shown at 73 in Figure 17. In assembling these forming-disks 36, 38, the former 36—for example—is firstly placed with its lower slot 67 over the fixed stud 37 and its upper slot 66 over the crank pin 35, whereupon the other forming-disk 38 is similarly placed by the pivot hole 71 on said stud 37 and its elongated slot 70 on the crank pin 35. Now assuming the crank pin 35 is—as shown—in its lowermost or neutral position, it will be understood that the apertures 68, 69 therein are in register, whilst both the forming-disks 36, 38 will be positioned in even register with the bore 30 of the bearing 26, that is to say, neither forming-disk will break joint or project into the entry clearance 31 thereby permitting the free insertion of the tubular section to be operated upon.

In order to limit and control the lateral movements of the forming-disks 36, 38, as well as to maintain them in close working and non-binding relation, I employ a clamping die or collar 74 as shown to an enlarged scale in Figures 6, 13 and 14, said clamping die or collar 74 having a relatively large eccentric bore 75 to provide a clearance for the end of the crank pin 35, a counter bore 76 which is screw-threaded at 77 for connection on the hereinbefore referred to fixed stud 37 whereby it can be accurately adjusted relative to the forming-disk 38, after which it is rigidly retained by means of a washer and lock nut 78. Spaced holes 79 are also formed through the clamping die or collar 74 for the passage of filister-headed pins 80 which traverse the apertures 69, 68 in the forming-disks 38, 36, and are screw-threaded into the plug block 28', said filister-headed pins 80 providing the limiting means for the lateral movements of the forming-disks 38, 36 above referred to. It is also to be here noted that the lower part of the clamping die or collar 74 is rounded off at 81 for a purpose later on explained

whilst the inner face is slightly recessed to provide an annular bearing or working surface 82 whereby friction is reduced to a minimum between said collar 74 and the adjoining forming-disk 38.

Secured at the back of the bearing 26 by a cap screw or the like 83 is a longitudinal bar 84 which serves to support and hold down the joint of a seamless or split tubular section when being operated upon, said bar 84 being mounted in spaced relation over the tubular mandrel 27 and extending substantially the full length thereof.

The feeding forward of the tubular section step-by-step is accomplished by the mechanism now to be described and which consists of an annular yoke or thrust collar 85 having a working fit on the tubular mandrel and being annularly grooved at 86 for the insertion and abutment therein of the inner end of the tubular section, said collar 85 also being holed or slotted at 87 for its free passage along the longitudinal bar 84. Integral with or securely fixed to the thrust collar 85 is a rack bar 88 having teeth 89 in number equal to the maximum number of creasings 90—Figure 10—required in an elbow 91 of the desired angular configuration. The intermittent feeding forward of the rack bar 88 is effected by means of a gravity fall pawl 92 secured to a hinge pin 93 journaled in a straddle yoke 94 pivotally mounted at 95 on the bearing 25. Journaled on stud bolts or other appropriate pivots 96 at each side of the straddle yoke 94 is the connecting rod 97 of a strap eccentric 98 mounted or securely fixed to the drive shaft 22 whereby it will be clearly seen that said strap eccentrics 98 effect the forward forcing of the rack bar 88 and thrust collar 85 through the mechanism just described.

Having described in detail the structure of my elbow making machine I will now briefly describe its operation, assuming by way of example only that it is desired to form an elbow from a seamless straight tubular section. The annular die or creasing collar 40 occupying its normal position as shown clearly by Figure 2, and the thrust collar being moved backwards towards the bearing 25 to the required extent, the operator forces the seamless straight tube through the aforesaid die or creasing collar 40 and entry clearance 31 onto and along the tubular mandrel 27 until its inner end engages in the annular groove 86 of the thrust collar 85. It is to be particularly observed that during the aforesaid operation the seamless part of said straight tube is caused to abut or overlap longitudinally beneath the longitudinal bar 84. The machine is now set in operation which results through the meshing of the interrupted or mutilated gear 34 with the bevel gear 33 in imparting one complete revolution to the shaft 32. As hereinbefore

explained at the commencement of rotation of this shaft 32 the crank pin 35 is at its lowermost position and during the first quarter rotation of said shaft the forming-

5 disks 36, 38, are moved over to the right hand as shown by Figure 7 causing a slight distortion or expansion of the metal between the opposed flared faces 39 and 41 thereby commencing to form the V-shaped out-

10 wardly directed expanded part or rib 42. As the shaft 32 continues rotating to its complete half turn as shown in Figure 8 the expanded or rib part 42 is eccentrically increased to its maximum expansion by the

15 forming-disks 36, 38, being traveled as hereinbefore set forth. Continued rotation of the shaft 32 in a contra-clockwise direction as indicated by the arrows on Figures 7, 8

20 moves the forming-disks to the position illustrated by the latter figure with a gradually diminishing eccentricity in the continued formation of the expanded part or rib 42. From this latter position to the initial position the forming-disks 36, 38 are

25 retracted eccentrically inwards with the finishing of the part or rib 42 on the left-hand side thereof, and as said disks 36, 38 register with the adjoining end of the mandrel

30 27, the toothed portion of the interrupted or mutilated gear 34 leaves the bevel gear 33 and further rotation of the shaft 32 stops for an interval of time. Instantly the dis-

35 connection of the gears 34, 33 takes place the rod or pitman 57 is sharply moved forward by the internal cam 62 which moves the locking lever 54 outwards away from the annular die or creasing collar 40, said move-

40 ment being instantly followed by the strap eccentrics 98 through the connecting rods 97 rocking the straddle yoke 94 forward on its pivots 95. Consequent upon the forward rocking of the straddle yoke 94 the gravity

45 fall pawl 92 forces the rack bar 88 forward the distance of one tooth 89, and due to the abutment of the tubular section in the annular groove 86 of the thrust collar, a compressive force will be exerted on the tube. As a result of this forward thrust or move-

50 ment of the tube the annular die or creasing collar 40 will be initially swung outwards and upwards to the dotted line position indicated by the numeral 99 on Figure 6 which results in a raising of the lower edge of the

55 rib or bead 45 sufficiently for the top or high point of the expanded part or rib 42 to be forced thereunder. The continued forward movement of the thrust collar 85 causes the expanded part or rib 42 to be folded over on

60 to the surface of the pipe under the compression of the arcuate bead or rib 45 of the annular die or creasing collar 40 as will be readily understood by those acquainted with the art to which this invention appertains.

65 It will be clearly understood that the fore-

going operation takes place during the forward movement of the strap eccentrics 98 and internal cam 62 and that during their return stroke the straddle yoke 94 will be retracted and thereby move the gravity fall 70 pawl 92 into engagement with the next succeeding tooth 89 of the rack bar 88. The machine will now be in position to commence the forming of the next expanded part or rib 42 in that the mutilated gear 34 will 75 again enter into mesh with the bevel gear 33. By way of example a seamless tubular section is indicated by the dotted lines 100 in Figure 6 and said showing is intended to illustrate the initial radial deflection of the 80 outer end of a pipe after the first creasing is effected. Obviously, the machine will operate in identical manner upon seamed tubular sections as the bar 84 effectively prevents any upward bulging in either case, 85 and it will be clearly apparent that by my invention there is provided an elbow making machine that will rapidly produce highly finished elbows from straight tubular sections in a minimum of time with a conse- 90 quential increased output and the saving of much time and labor.

Whilst there has been shown and minutely described a preferred embodiment of my invention it is to be clearly understood that 95 many detail changes and variations can be effected without departing from the essential features as hereinbefore set forth, and the right is hereby reserved to make all such reasonable modifications thereof as fairly 100 fall within the scope of the appended claims.

Having described my invention, what I claim as new and desire to secure by Letters Patent is:

1. In an elbow making machine the com- 105 bination with a base having spaced bearings, a tubular mandrel having plugged ends securely mounted in one of the bearings and having its free end concentric within the bore of the other bearing the outer side 110 whereof is eccentrically flared, a shaft eccentrically journaled in the plugged ends of the tubular mandrel and having a longitudinally projecting crank pin, an annular clamping die, abutting forming-disks oper- 115 able by the crank pin and fulcrumed between the end of said mandrel and said annular clamping die, a creasing die hingedly mounted concentrically over the clamping die, means for intermittently preventing 120 movement of the creasing die, and means for feeding a tubular section from off the mandrel after the creasing die is released and returned.

2. In an elbow making machine the com- 125 bination with a base having spaced bearings, a tubular mandrel securely mounted in one of the bearings and having its free end concentric within the other bearing, the outer side whereof is eccentrically flared, a shaft 130

5 journaled within and in parallel relation to the axis of the tubular mandrel, said shaft having a crank pin projecting from its outer end, an annular clamping die, abutting forming-disks operable by the crank pin and fulcrumed between the end of said mandrel and said annular clamping die, a creasing die hingedly mounted concentrically over the clamping die, means for intermittently preventing movement of the creasing die, and means for feeding a tubular section from off the mandrel after the creasing die is released and returned.

15 3. In an elbow making machine the combination with a base having spaced bearings, a tubular mandrel securely mounted in one of the bearings and having its free end concentric within the other bearing, the outer side whereof is eccentrically flared, a shaft journaled within and in parallel relation to the axis of the tubular mandrel, said shaft having a crank pin projecting from its outer end, an annular clamping die, overlying forming-disks operable by the crank pin and fulcrumed between the outer end of said mandrel and said annular clamping die, one of said forming-disks having an oscillatory and the other an eccentric peripheral movement relative to their common fulcrum, a creasing die hingedly mounted concentrically over the clamping die, means for intermittently preventing movement of the creasing die, and means for feeding a tubular section from off the mandrel after the creasing die is released and returned.

40 4. In an elbow making machine the combination with a base having spaced bearings, a tubular mandrel securely mounted in one of the bearings and having its free end concentric within the other bearing, the outer side whereof is eccentrically flared, a shaft journaled within and in parallel relation to the axis of the tubular mandrel, an annular clamping die, said shaft having a crank pin projecting from its outer end, overlying forming-disks operable by the crank pin and fulcrumed between the outer end of said mandrel and said annular clamping die, one of said forming-disks having an oscillatory and the other an eccentric peripheral movement relative to their common fulcrum, the eccentrically moving forming-disk having diametrically aligning slots to permit of its eccentric movement, a creasing die hingedly mounted concentrically over the clamping die, means for intermittently preventing movement of the creasing die, and means for feeding a tubular section from off the mandrel after the creasing die is released and returned.

50 5. In an elbow making machine the combination with a base having spaced bearings, a tubular mandrel securely mounted in one of the bearings and having its free end concentric within the other bearing, the outer

side whereof is eccentrically flared, a shaft journaled within and in parallel relation to the axis of the tubular mandrel, said shaft having a crank pin projecting from its outer end, an annular clamping die, overlying forming-disks operable by the crank pin and fulcrumed between the outer end of said mandrel and said annular clamping die, one of said forming-disks having an oscillatory and the other an eccentric peripheral movement relative to their common fulcrum, means for limiting the oscillatory and eccentric peripheral travel of the forming-disks over the end of the tubular mandrel, a creasing die hingedly mounted concentrically over the clamping die, means for intermittently preventing movement of the creasing die, and means for feeding a tubular section from off the mandrel after the creasing die is released and returned.

60 6. In an elbow making machine the combination with a base having spaced bearings, a tubular mandrel securely mounted in one of the bearings and having its free end concentric within the other bearing, the outer side whereof is eccentrically flared, a shaft journaled within and in parallel relation to the axis of the tubular mandrel, said shaft having a crank pin projecting from its outer end, an annular clamping die, overlying forming-disks operable by the crank pin and fulcrumed between the outer end of said mandrel and said annular clamping die fashioned with a rounded lower frontal part, one of said forming-disks having an oscillatory and the other an eccentric peripheral movement relative to their common fulcrum, means for limiting the oscillatory and eccentric peripheral travel of the forming-disks over the end of the tubular mandrel, a creasing die hingedly mounted concentrically over the clamping die, means for intermittently preventing movement of the creasing die, and means for feeding a tubular section from off the mandrel after the creasing die is released and returned.

70 7. In an elbow making machine the combination with a base having spaced bearings, a tubular mandrel securely mounted in one of the bearings and having its free end concentric within the other bearing, the outer side whereof is eccentrically flared, a shaft journaled within and in parallel relation to the axis of the tubular mandrel, said shaft having a crank pin projecting from its outer end, an annular clamping die, overlying forming-disks operable by the crank pin and fulcrumed between the outer end of said mandrel and said annular clamping die fashioned with a rounded lower frontal part, one of said forming-disks having an oscillatory and the other an eccentric peripheral movement relative to their common fulcrum, means for limiting the oscillatory and eccentric peripheral travel of the form-

ing-disks over the end of the tubular mandrel, a hinged creasing die concentric with the clamping die and having an eccentric flaring opposed to the aforesaid flared bearing, an internal arcuate bead within the creasing die and a concave outlet therefrom, means for intermittently preventing movement of the creasing die, and means for feeding a tubular section from off the mandrel after the creasing die is released and returned.

8. In an elbow making machine the combination with a base having spaced bearings, a tubular mandrel securely mounted in one of the bearings and having its free end concentric within the other bearing, the outer side whereof is eccentrically flared, a shaft journaled within and in parallel relation to the axis of the tubular mandrel, said shaft having a crank pin projecting from its outer end, an annular clamping die, overlying forming-disks operable by the crank pin and fulcrumed between the outer end of said mandrel and said annular clamping die fashioned with a rounded lower frontal part, one of said forming-disks having an oscillatory and the other an eccentric peripheral movement relative to their common fulcrum, means for limiting the oscillatory and eccentric peripheral travel of the forming-disks over the end of the tubular mandrel, a hinged creasing die concentric with the clamping die and having an eccentric flaring opposed to the aforesaid flared bearing, an internal arcuate bead within the creasing die and a concave outlet therefrom, an internal cam, a locking lever operable by said internal cam for intermittently preventing movement of the creasing die, and means for feeding a tubular section from off the mandrel after the creasing die is released and returned.

9. In an elbow making machine the combination with a base having spaced bearings, a tubular mandrel securely mounted in one of the bearings and having its free end concentric within the other bearing, the outer side whereof is eccentrically flared, a shaft journaled within and in parallel relation to the axis of the tubular mandrel, said shaft having a crank pin projecting from its outer end, an annular clamping die, overlying forming-disks operable by the crank pin and fulcrumed between the outer end of said mandrel and said annular clamping die fashioned with a rounded lower frontal part, one of said forming-disks having an oscillatory and the other an eccentric peripheral movement relative to their common fulcrum, means for limiting the oscillatory and eccentric peripheral travel of the forming-disks over the end of the tubular mandrel, a hinged creasing die concentric with the clamping die and having an eccentric flaring opposed to the aforesaid flared bear-

ing, an internal arcuate bead within the creasing die and a concave outlet therefrom, an internal cam, a locking lever operable by said internal cam for intermittently preventing movement of the creasing die, a thrust collar movable longitudinally of the tubular mandrel and having an annular groove for feeding the end of a tubular section to be elbowed, and means for forcing the thrust collar forward step by step after each release and return of the creasing die.

10. In an elbow making machine the combination with a base having spaced bearings, a tubular mandrel securely mounted in one of the bearings and having its free end concentric within the other bearing, the outer side whereof is eccentrically flared, a shaft journaled within and in parallel relation to the axis of the tubular mandrel, said shaft having a crank pin projecting from its outer end, an annular clamping die, overlying forming-disks operable by the crank pin and fulcrumed between the outer end of said mandrel and said annular clamping die fashioned with a rounded lower frontal part, one of said forming-disks having an oscillatory and the other an eccentric peripheral travel over the end of the tubular mandrel, a hinged creasing die concentric with the clamping die and having an eccentric flaring opposed to the aforesaid flared bearing, an internal arcuate bead within the creasing die and a concave outlet therefrom, an internal cam, a locking lever operable by said internal cam for intermittently preventing movement of the creasing die, a thrust collar movable longitudinally of the tubular mandrel and having an annular groove for feeding the end of a tubular section to be elbowed, a toothed rack bar carried by said thrust collar, a pivoted yoke straddling the rack bar and having a gravity fall pawl engaging the teeth thereof, and means for moving said rack bar forwardly step by step after each release and return of the thrust collar.

11. In an elbow making machine the combination with a base having spaced bearings, a tubular mandrel securely mounted in one of the bearings and having its free end concentric within the other bearing, the outer side whereof is eccentrically flared, a shaft journaled within and in parallel relation to the axis of the tubular mandrel, said shaft having a crank pin projecting from its outer end, an annular clamping die, overlying forming-disks operable by the crank pin and fulcrumed between the outer end of said mandrel and said annular clamping die fashioned with a rounded lower frontal part, one of said forming-disks having an oscillatory and the other an eccentric peripheral travel over the end of the tubular mandrel, a hinged creasing die concentric with the clamping die and having an eccentric flaring

opposed to the aforesaid flared bearing, an internal arcuate bead within the creasing die and a concave outlet therefrom, an internal cam, a locking lever operable by said internal cam for intermittently preventing movement of the creasing die, a thrust collar movable longitudinally of the tubular mandrel and having an annular groove for feeding the end of a tubular section to be elbowed, a toothed rack bar carried by said thrust collar, a pivoted yoke straddling the rack bar and having a gravity fall pawl engaging the teeth thereof, and strap eccentrics for rocking the pivoted yoke to effect the intermittent feeding forward of the thrust collar after each release and return of the creasing die.

12. In an elbow making machine the combination with a base having spaced bearings, a tubular mandrel securely mounted in one of the bearings and having its free end concentric within the other bearing, the outer side whereof is eccentrically flared, a shaft journaled within and in parallel relation to the axis of the tubular mandrel, said shaft having a crank pin projecting from its outer end, an annular clamping die, overlying forming-disks operable by the crank pin and fulcrumed between the outer end of said mandrel and said annular clamping die fashioned with a rounded lower frontal part, one of said forming-disks having an oscillatory and the other an eccentric peripheral travel over the end of the tubular mandrel, a hinged creasing die concentric with the clamping die and having an eccentric flaring opposed to the aforesaid flared bearing, an internal arcuate bead within the creasing die and a concave outlet therefrom, a locking lever operable by an internal cam for intermittently preventing movement of the creasing die, a thrust collar movable longitudinally of the tubular mandrel and having an annular groove for feeding the end of a tubular section to be elbowed, a toothed rack bar carried by said thrust collar, a pivoted yoke straddling the rack bar and having a gravity fall pawl engaging the teeth thereof, and means for preventing the bulging of the tubular section during the creasing operation.

13. In an elbow making machine compris-

ing a base having bearings, a mandrel supported by one of said bearings, a shaft journaled longitudinally in said mandrel and having a projecting crank pin at its free end, means for intermittently rotating said shaft, a hinged forming and creasing die at the outer end of said mandrel, abutting forming-disks operable by the crank pin and fulcrumed on the end of said mandrel, the combination of an annular clamping die, said die being fashioned with a lower frontal part and an eccentrically disposed aperture therein to permit the rotation of the aforesaid crank and oscillation of the forming-disks.

14. A machine for making elbows from tubular metal sections comprising a base having spaced bearings, a tubular mandrel securely mounted in one of the bearings and having its free end concentric within the other bearing, the outer side whereof is eccentrically flared, a shaft journaled within and in parallel relation to the axis of the tubular mandrel, said shaft having a crank pin projecting from its outer end, an annular clamping die, overlying forming-disks operable by the crank pin and fulcrumed between the outer end of said mandrel and said annular clamping die fashioned with a rounded lower frontal part, one of said forming-disks having an oscillatory and the other an eccentric peripheral travel over the end of the tubular mandrel, a hinged creasing die concentric with the clamping die and having an eccentric flaring opposed to the aforesaid flared bearing, an internal arcuate bead within the creasing die and a concave outlet therefrom, an internal cam, a locking lever operable by said internal cam for intermittently preventing movement of the creasing die, a thrust collar movable longitudinally of the tubular mandrel and having an annular groove for feeding the end of a tubular section to be elbowed, a toothed rack bar carried by said thrust collar, a pivoted yoke straddling the rack bar and having a gravity fall pawl engaging the teeth thereof, and means for preventing the bulging of the tubular section during the creasing operation.

In testimony whereof I affix my signature.

AUGUST D. KUMPF.